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country is a dissected plateau, with a more or less continuous range of comparatively low mountains stretching from north to south and dividing the country into two unequal parts, the Paraguay and Paraná drainage regions. This plateau, according to the author, lowers gradually from the north to the south; at Punta-Pona near the northeastern corner it is 660 meters above sea level. At Ipê Hu it is 420 meters; at Caaguazú near the center it is 300 meters; and at Encarnación in the southeastern corner, at the big bend of the Paraná River, it is 120 meters.

The plateau region contains a subtropical rain forest generally speaking; that to the east of the divide is better developed than that to the west, but both forested regions are interrupted by grasslands and savana forests. The main part of the report deals with autecological rather than synecological problems; that is the species are treated as individuals rather than in communities. The publication is well illustrated with pen sketches and reproductions from photographs, which give one a better idea of the vegetation than the text; and with numerous drawings of the microscopic features of the plant tissues. Some new species are described.

H. N. WHITFORD

AN IMPORTANT CONTRIBUTION TO THE GEOGRAPHY OF ARCTIC ALASKA

E. DEK. LEFFINGWELL. **The Canning River Region, Northern Alaska.** With a preface by A. H. Brooks. 251 pp.; maps, diagrs., ills., bibliogr., index. *U. S. Geol. Survey Professional Paper 109*, Washington, D. C., 1919. 11½ x 9 inches.

The region that Mr. Leffingwell describes lies on the northern coast of Alaska facing the Arctic Ocean and about 60 miles west of the International Boundary. A more bleak or inhospitable place could hardly be imagined, but the author must have been actuated by a great love of arctic nature for he kept going back to the region time after time, so that during the ten years between 1905 and 1915 he spent six winters and nine summers there, and all at his own expense. His work and observations covered a very wide range. He made a reconnaissance, a topographical and geological map of a rectangle 70 miles square, and examined the geological structure; he made a map of the coast line for 300 miles, along one-half of which he carried a network of triangles; he determined his latitude with a probable error of a fraction of a second and his longitude by lunar occultations with a probable error of 7 seconds. He made soundings through the ice to a distance of about 100 miles from shore; the continental shelf extended out about 50 miles, and there he found a sudden change of depth from 30 to 320 fathoms in a distance of 2½ miles. Beyond this his line of 320 fathoms found no bottom. Captain Mikkelsen, who was with him the first year, made careful tidal observations; and Mr. Harris, of the U. S. Coast and Geodetic Survey, found that they supported the idea of extensive land in the Arctic Ocean to the north. This land has never been seen, but we must remember that the region where it is supposed to be has not been explored.

Mr. Leffingwell tells us of the climate and of the animal life and gives a long discussion of the ground ice; but let us summarize some of his results.

The region he studied partially bridges the gap between the region examined by the geologists of the International Boundary Survey on the east and that examined by the geologists of the U. S. Geological Survey on the west. All these studies show that the general structure of northern Alaska trends about east and west and is fairly continuous from the International Boundary to Cape Lisburne. Topographically the Endicott Mountains form the watershed between the Yukon River and the Arctic Ocean; the range is known under special names in its different parts. North of this is a piedmont plateau and then a coastal plain. In the region examined by Mr. Leffingwell these three provinces are separated by scarps which give the appearance of faults, but which in places may be steep folds. The main mountain range is made up of strongly folded schists of pre-Carboniferous age with some igneous intrusives. It rises to a general height of about 6,000 feet, with a few peaks as high as 9,000. The higher parts are covered with snow giving rise to numerous glaciers. These, however, could not be explored, but, according to Mr. Leffingwell's pictures and descriptions, they have no peculiar characteristics. In front of the Endicott Mountains, between the Canning and Okpilak Rivers, are three mountain ridges made up of folded Carboniferous limestones and sandstones, with gentle slopes towards the south and steep slopes to the north; their surfaces seem structural; they strongly suggest tilted blocks. They end abruptly, their folds apparently plunging down at both ends. In front of the mountains the piedmont plateau, but little dissected, consists of upturned and planed-off Mesozoic and Tertiary strata; and the coastal plain down to the ocean is a flat featureless plain of very recent deposits. The rivers are parallel and closely spaced, all flowing across mountains, plateau, and plain to the Arctic Ocean; they give the impression of simple subsequent streams, though their origin is not entirely clear. There seems to have been no deformation of the region at the end of the Paleozoic; but since Jurassic or Cretaceous times, and to the end of the Tertiary, it has suffered many disturbances with more or less peneplanation in between.

The description of the general erosion of the region and of the formation of sand bars and spits along the coast, etc., indicates no material difference from temperate regions; but in the frozen ground of the tundra we find a phenomenon peculiar to the far north.

The subject of ground ice and frozen ground is treated very fully. The observations of previous writers are summed up and largely quoted. Middendorff's studies of the Schergin shaft in Siberia, which are not easily accessible, are given in some detail. This shaft was sunk at Yakutsk, Siberia, in the early part of the last century with the hope of finding water for the town, but it did not penetrate below the frozen ground even at a depth of 382 feet. In 1844–1846 Middendorff made extensive observations on the temperature in the wall of the shaft at various depths below the earth's surface. The general result showed a temperature gradient which flattened out with depth and seemed to indicate, by its steeper gradient near the surface, that the mean annual temperature of Yakutsk had been recently lowered by nearly 5° C. at the time of Middendorff's observations. In Alaska several shafts have been sunk about 200 feet, and one reached 365 feet, without penetrating below the frozen ground. Various theories as to the origin of this condition are discussed, and the attempt is made to determine the age from the temperature gradient; but with little success, for much detailed data are needed which are not available. Nevertheless the attempt is interesting and may sometime yield more definite results. The "ground ice wedge" is an interesting form which is apparently widespread in the northern tundra. The ice occurs in the form of wedges very free from mixture of earth. They are ten or twenty feet across at the top, a few feet below the surface of the muck, and narrow out below, apparently disappearing at a depth of twenty or thirty feet. The author connects them with the frost cracks which form with loud reports in the ground during the great cold of winter; later, water flows into these cracks and freezes; and, as the whole warms up during the summer, the expansion squeezes up the sand and clay on the sides and so produces a slightly uneven land surface broken into polygonal blocks, the frost cracks occupying the depressions between them. This process continues year after year, and the ice wedges grow in size.

Many details and interesting descriptions of ground ice, sea ice, and ice formed by the rivers and domed up under hydraulic pressure are given; but they must be passed over with a mere reference.

The difficulties Mr. Leffingwell encountered were serious. In summer he had to be his own pack horse, which interfered greatly with his excursions into the mountains; in winter, when journeys could be taken by sleds, the snow covered much that he wanted to see. One must admire the energy and enthusiasm with which he stuck to his purpose, going back year after year, improving and broadening his observations in the face of many obstacles. It is by just such persevering work as his that knowledge of the difficultly accessible regions of the earth is becoming definite.

HARRY FIELDING REID

A TEXTBOOK OF AUSTRALIAN METEOROLOGY

GRIFFITH TAYLOR. **Australian Meteorology: A Text-Book including Sections on Aviation and Climatology.** xi and 312 pp.; maps, diagrs., index. Clarendon Press, Oxford, 1920. $5.65. 8½ x 5½ inches.

Meteorologists the world over will welcome this excellent book which throughout is characterized by that originality and stimulation with which the readers of the *Geographical Review* are already familiar in Dr. Taylor's contributions. The work is primarily intended as a general textbook for students of meteorology and climatology in Australia, but, unlike most textbook writers, Dr. Taylor has written for foreign readers quite as much as for those at home. There are many valuable suggestions to the teacher, particularly on the advantage of using Australia as a climatic model to show the temperature and rainfall effects of the seasonal migrations of the sun, and, in turn, the control of the resulting climates over the